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ABSTRACT

The study of manpower requirements has received much attention since 1960, but it may be argued that the results of these studies did not come up to the expectations of those involved in the conduct of manpower research. The high percentage of unemployed professionals we are now experiencing brings us to formulate vigorous objections toward certain economic theories concerning the rate of return on education. The expectations of higher education would be less deceiving if a body of information were provided to people concerned. For example, research results about graduates or drop-outs at the beginning of their earning careers would be beneficial. This study would follow up the students in their year-to-year progression, in their graduation and their integration into the labor force. Such a study would not consider university dropouts as wastage but would follow up these human resources so as to know the reasons why they quit school and to clarify to what extent their partial studies helped them in their jobs. (Author/HS)

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Demographic and Social Accounting and its Application to Educational Activities

The study of manpower requirements has encountered attention since 1960. The emerging of newly independent countries called for solutions to their development by training a labor force that would contribute to their economic growth. UNESCO and OECD were at the origin of many studies in this field, as were the U.S.A., Canada and other industrialized countries which have made estimates of their highly qualified manpower needs. Recent bibliographies on the subject convince us about the importance of the problem and the serious efforts that were made to bring about significant contributions.[1]

Today, it may be argued that the results of those studies did not come up to the expectations of those involved in the conduct of manpower research. The high percentage of unemployed professionals we are now experiencing brings us to formulate vigorous objections toward certain economic theories concerning the rate of return on education. The periodic shortages and surpluses of scientists and engineers or the imbalanced cycles of demand and supply of a qualified manpower oblige us to revise our policy of action. Also, the crescendo of the early sixties that considered the prolongation of schooling as a mechanism that would generate additional production and returns is diminished by the actual economic crisis and the protest of university graduates looking for work.

The expectations of higher education would be less deceiving if a body of information was provided to people concerned, university authorities and students alike. For example, research results about graduates or drop-outs at the beginning of their earning careers; or the results of a longitudinal study of student population by cohorts. This study would follow up the students in their year-to-year progression, in their graduation and their integration to the labor force. Such a study would not consider university drop-outs as wastage but would follow up these "semi-finished" human resources so as to know the reasons they quit school and to clarify up to what extent their partial studies helped them in their job. A longitudinal study could

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1 "International Development Education," AERA Review of Educational Research, XXXVIII, 3 (June 1968), bibliographies of the different reviews; K. Lederer and P. Bourgette, Selected, Annotated Bibliography on Manpower Evaluation. Alberta: H.E.R.C., 1970; A.P. Contandriopoulos, Previsions des besoins en main d'oeuvre hautement qualifiée et planification de l'éducation. Montreal: La Conférence des Recteurs et des Principaux des Universités du Québec, May 1971, Bibliography.

The aim of this presentation is to show the need for a demographic accounting of the student population, containing life-sequence and social aspects that may be used as indicators in the decision-making of universities or of the students themselves. Also, demographic information may be profitably mixed with educational and employment statistics as to aspects of professional and social mobility. Once integrated, this body of information contributes to an explicit social accounting.[2]

The foundations of the demographic accounting applied to educational activities.

The demographic accounting is a means of arranging within one same framework incongruous demographic and social data. A longitudinal analysis is the logical way to deal with population phenomena. Like other types of accounts, the demographic version is based on the balance of inflows and outflows during a certain period. By borrowing from economics the concept of semi-finished and finished products, the approach consists of taking human beings as a basic unity around which different categories of social statistics are integrated, and to establish a series of input-output matrices. The latter provide an account of student stocks and flows, from one year to another and from one educational activity to a different one, as the national economic accounting gives information on stocks and flows of capital, labor, goods and services.

From an operational point of view, the student population should be considered by cohorts and should be distributed by school-years; each school-year should be divided in categories reflecting the characteristics in which we are interested: age, sex, discipline, level of studies, profession desired, etc. The combination of the different data written down in matrices provides a number of composite categories or "situations" that enables us to discern the gradual transformation of human stocks. Thus, demographic accounting becomes a tool for educational planning.

The difference between the accounting method and the traditional approach in university management is due to the fact that the latter looked for data concerning its administrative needs only. University administrators collected statistics on

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2 R. Stone, Demographic Accounting and Model-Building. Paris: OECD, 1971. The author describes some aspects of demographic accounting and its links with the economic accounts. This paper borrows from his report.

Sociological aspects that may explain student mobility are reflected in the answers to the questionaire. These aspects would contribute to clarify the relation existing between the university as a training institution and the labor force as well as the relation existing between the university community and the public in general. Data collected from this inquiry may help to foresee the reasons and factors that bring about change and may enlighten about the university evolution in different circumstances.

The setting up of a demographic accounting

As in other accounts, demographic accounts are based on inflows and outflows balance during a given pedied. In our case, these flows consist of students that are following a university term (one school-year) or are leaving the term wether to pursue the following year's curriculum or to become part of the "outside world". The surviving ones of the preceding year constitute the initial stock for the present year and the survivors that pass on to the following year are considered as the terminal stock. For a given period the balance between inflows and outflows implies that the difference between the two stocks represent the contribution of the outside world (students entering the second or the third year of the curricula).

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To build a demographic accounting system, the student population must be distributed by grades on a yearly basis, taking into account characteristics that might be helpful such as faculty, department, programme, undergraduate or graduate levels, etc. Once data have been structured within a taxonomic framework, they may be presented as entries in an account showing, on one side, in what formation each group entered the period and on the other side, how it redistributes itself among the various categories before leaving the period. The accounting identities connecting the flows and stocks will ensure that the same number of students will flow out of a category as have flown into it. Nevertheless, before setting up accounts, it is necessary to have a clear idea of how one intends to determine the elements. What is a student population? What are the main characteristics that ought to be brought out and how should they be combined? Which is the best way of presenting the information? Here are some points we would have to solve. A) The time interval - In economic accounts the time interval consists of a year and is based on the civil year. In education it would be logical to retain the first of October, since this would give us the student repartition at the beginning of the academic year. It would be difficult to calculate the inscriptions on a semester, half time or part-time periods. The initial choice favors student cohorts based on year-to-year flows. This choice may be reconsidered later on when the acquired experience will facilitate adaptations. B) Definitions of categories and situations - Categories and classifications appropriate to demographic accounting are partly institutional, partly economic, partly familial and partly personal.@ Concerning students, the age, the sex, the object and level of studies, the occupation of those who have quit or graduated, etc. constitute the categories and situations. The interaction of these classifications create composite categories or situations that allow to divide the population in differentiated groups or life-sequences such as being 23 years old, having terminated a B.A. with honors and working in one's specialization. C) Horizontal analysis and cohorts - As in economics, in demographic accounting a distinction is made between the horizontal analysis (in a particular year) and the time-series analysis. We can consider the changes of state occuring in a particular year for all the students who flow into that year; we can also follow up through succession the evolution of a student cohort. It is quite obvious that a study which does not extend over a "generation"(the period

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@ The same longitudinal studies may be pursued for student groups as well as for labor cohorts in the principal economic sectors and the services.

The Utility of Demographic Accounting

A demographic account model is based on year-to-year flow of educational activities. It brings to light the students repartition, and its precision depends mainly on the informations that can be included in the model. It can be improved in a later stage. Like all input-output models, the demographic version is based on fixed-choice assumptions that are rigid at times; in its initial phase some questions remain which it cannot answer. It may help in the following cases.

a) When making educational projections it is necessary to take into account changes in the educational system. Educational statistics, those of the universities included, concentrate much more on stocks than on flows. Thus, it is difficult to study the system's dynamism. Our model combines the different educational activities and brings out a more comprehensive and coherent frame of reference. Information gathered on graduates or drop-outs may be of great utility as feedback in university program evaluation or may serve as university and public relations control.

b) The model provides productivity indices (transition coefficients) and makes possible a number of detailed analyses. In this context it becomes a tool for educational planning (see a demographic accounting model in Appendix).

c) Our model may be linked to other demographic accounting models such as those concerning community colleges. Access to higher education depends on the combined factors such as previous courses taken, family and environment that condition the desire to pursue further studies. The linking of the community college outflows with our inflows may guide the authorities concerned with future university population.

d) Similarly, for employment reasons, it is necessary to link the outflows of our system with the inflows of the labor force. The combination of educational and employment data may help students in the choice of their careers and provide feedback to the university activities.

e) An integrated system helps to find out up to what extent the existing data may be adapted to analytical needs. Thus, outflow data concerning students entering their professional life is seldom collected, our model may contribute to the data needed for economic planning.

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f) An integrated system is indispensible for comparing purposes. An exact understanding of the connections among considerable bits of information gives all the importance to a framework in which every bit is seen to have its place.

g) The demographic accounting enables the quantitative expression of certain life-sequences. It is helpful when the information gathered contribute to decision-making and planning. The student population accounts of a certain university may be added to the total student population of the province or the country so as to become a national accounting. Compilations based on student inflows and outflows linked with the employment data contribute to educational planning, to manpower forecasting and to the economic development in general. It is helpful to many ends.

It matters little that in the early phases gaps and inconsistencies appear in a well conceived system, since these deficiencies may facilitate the establishment of priorities for the collection of new data.

Demographic Accounting and its relationship to Institutional Research

What is the relationship of the demographic accounting to institutional research? The latter also developed in the sixties. It is diversified and may be defined as the effort made by an organization to study itself so as to reach its objectives in a better way. It consists of a systematic analysis of the functioning of the organization and the efficiency with which the latter uses its resources. The aim of this analysis is to enable the administration to reach better decisions resulting from a more detailed information.

Today, institutional research in higher education goes beyond the practices existing in the early sixties. Besides solving management problems and looking for better utilisation of buildings and equipment, the research tries to reach the heart of the problem and estimate what is really going on in the classrooms.[4]

The demographic accounting is linked with institutional research in the following manner. If the research constitutes a way of studying the system's operation, it does it in a certain sense from within by testing its different elements, while the demographic accounting contributes to study the operation from the exterior by providing a larger frame of reference and by reflecting the feedback of university training and employment relation.

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4 F. Rourke and G. Brooks, The Managerial Revolution in Higher Education. Baltimore: John Hopkins Press, 1966, 64-67.

Demographic accounting, as has been said, has substantive uses. It makes possible institutional projections and arrangements and contributes to the formulation of consistent educational and manpower policies. It allows the university to link its accounts to those of other universities or other social and economic systems of the province and the country.

Appendix

Table 1

A demographic matrix *

(A year-to-year outflow, University X, 1970-71 and 1971-72)

		Outside world	Faculties		Total outflows
			1970-71 (This year)	1971-72 (Next year)	
New students			2,050	2,100	
Faculties	1969-70 Last Year	2,000	10,150		12,150
	1970-71 This year	2,200		10,000	12,200
Total inflows			12,200	12,100	

* Fictitious names and figures.

Table 2 *

A symbolic version of Table 1

		Outside world	Faculties		Total outflows
			This year	Next year	
New students			e'	A e'	
Faculties	Last year	$A^{-1}a$	$A^{-1}Si$		$A^{-1}p$
	This year	a		Si	p
Total inflows			p'	Ap'	

* This symbolic version as well as the following model are adapted from Stone, op. cit., p. 92-93

Meaning of the symbols :

P — the vector of population flows,
e — the vector of new students,
a — the vector of leaving students (graduates, drop-outs),
S — the matrix of survivors,
i — the unit column vector, so that Si denotes the row sums of S,
Λ — the lag operator which shifts in time the variable to which it is applied, so that if S denotes this year's survivors, Λ^{-1} S denotes last year's survivors, and ΛS denotes next year's survivors,

the prime superscript(') indicates transpositions; P' is a row vector formed from the elements of the column vector P, S' is a matrix formed by interchanging the rows and columns of S.

Model based on outflow coefficients (transition coefficients)

From the row for this year, in Table 2, we can see that the population outflow, consists of this year's leaving students (graduates, drop-outs) plus the survivors into next year. That is :

$$P = Si + a \qquad (1)$$

From the column for this year, in Table 2, we can see that the flows of population into this year consist of the survivors from last year plus this year's new students. That is :

$$P' = \Lambda^{-1} Si + e' \qquad (2)$$

or, on transposing the variables :

$$P = \Lambda^{-1} S'i + e \qquad (3)$$

A matrix of transition coefficients C, can be formed by dividing the elements of each row of Λ^{-1}S by the corresponding element of Λ^{-1}P. Thus :

$$C = \Lambda^{-1} \hat{P}^{-1} \Lambda^{-1} S \qquad (4)$$

where $\Lambda^{-1}\hat{P}$ denotes a diagonal matrix, that is, a matrix with the reciprocals of the elements of Λ^{-1}P in its leading diagonal. The matrix C shows the proportion in which the survivors from last year distribute themselves among the various states open to them this year.

By transposing (4) and post-multiplying by $\Lambda^{-1}\hat{P}$, we can write

$$\Lambda^{-1} S' = C' \Lambda^{-1} \hat{P} \qquad (5)$$

and by substituting for Λ^{-1}S' from (5) into (3) we can write

$$P = C' \Lambda^{-1} P + e \qquad (6)$$

Equation (6) connects this year's population flows, P, with last year's population flows, Λ^{-1}P, and this year's new students, e. On the assumption that C remains constant, these equations can be used to make forward projections.